July 25, 1944. A. W. HARRIS ET AL 2,354,459

IMMERSION MEANS

Original Filed June 23, 1939

FIG. 1.

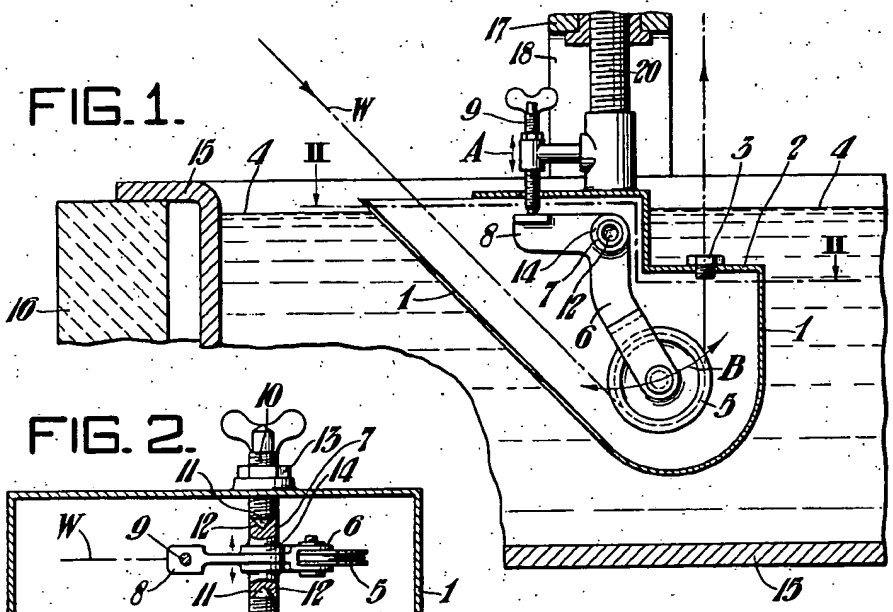


FIG. 2.

FIG. 3.

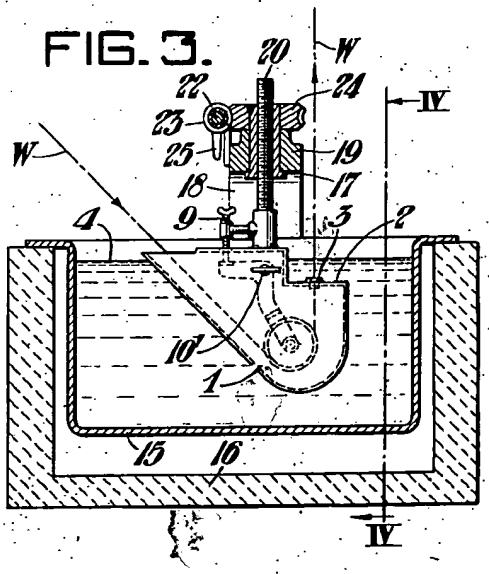
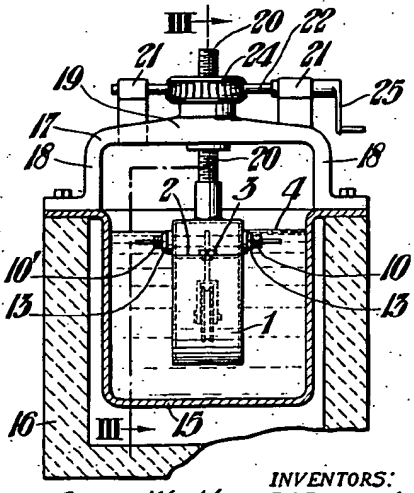


FIG. 4.



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IMMERSION MEANS

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Continuation of application Serial No. 280,894, June 23, 1939. This application April 12, 1943, Serial No. 482,782

3 Claims. (Cl. 91—12.5)

This invention relates to ways and means of immersing flexible articles, such as wire, strip, cables and the like into baths, and, more particularly, into baths of molten coating metal, such as are used in hot-galvanizing operations. The invention has for its principal field of application, coating one metal upon another, and, most particularly hot-galvanizing wire, rods or the like.

The present application is a continuation of an application, Serial No. 280,894, filed June 23, 1939.

In coating wire with molten metal, and particularly in hot-galvanizing wire, it is known that alloys of intermetallic compounds are formed between the coating and base metals which are oftentimes brittle. According to the prior art practice of submerging a wire beneath a stationary bar or roll sinker, the wire is subjected to a sharp bend beneath the surface of the bath, which is oftentimes responsible for cracking the alloy or metallic compound layer loose from the underlying metal, whereby the coating is rendered defective.

Another objection to the prior art practice of submerging a wire into coating baths, is that the wire is withdrawn from the bath at such an angularity that the forces, such as, gravity and adhesion which are constantly at work thereon, tend to pull the unsolidified coating metal to one side of the wire, which causes an eccentric or lop-sided coating that is undesirable. The immersion methods of the prior art are not adapted to meet the needs of certain modern practices that have been developed in coating wire, since the extent of immersion cannot be as accurately controlled as the operating conditions of such practices require. The present invention has for one of its objects the provision of ways and means for meeting the needs of such practices, and for overcoming the disadvantages set forth hereinbefore.

According to the present invention, an article being coated will not be exposed to the coating metal until its path of travel is substantially straight, whereby it will not be subjected to sharp flexing or bending subsequent to its encountering the metal. Also, the present invention provides for the emergence of the coated article from the surface of the bath, so that any effects of gravitation or adhesion will work to preserve the concentricity and smoothness of the coating.

Having reference to the accompanying drawing:

Figure 1 is a sectional elevation of an exemplary embodiment of the invention;

Figure 2 is a sectional view taken from the line II—II of Figure 1;

Figure 3 is a section taken from the line III—III of Figure 4; and

Figure 4 is a section taken from the line IV—IV of Figure 3.

Referring more particularly to the drawing in which like characters refer to like parts throughout, a sinker box 1 has an offset portion 2 in which a die 3 is positioned in communicating relation between the interior of the box and a bath of molten zinc 4 in which the sinker box is immersed.

The die 3 is composed of iron, or other suitable metal and has an orifice through which a wire W is adapted to pass. It is desirable that the orifice provide a clearance of from .002 to .006 of an inch in order that it will not be subjected to undue wear, or tend to scarify the wire. An orifice of .002 to .006 of an inch may be used without incurring the risk of molten zinc running into the box, while up to .010 of an inch, clearance may be employed with safety so long as the wire is kept moving therethrough.

The wire may be guided by any suitable means into and out of the box 1, but this is preferably accomplished by means of a sheave 5 located within the box so as to direct the wire W entering therein, upwardly through the orifice of the die 3. This sheave may be journaled on a fixed axis, although it is preferable that it be mounted so that alignment between the peripheries of the sheave and the axis of the die orifice may be corrected as required. To this end, the sheave may be mounted, as shown in the drawing, by journaling it to an arm member 6 mounted adjacent the top of the box by a pivoted shaft 7. The arm 6 is in the form of a bell-crank and its free end bears up on a hand-screw 9 which adjusts the position of its other end carrying the sheave 5.

When the hand-screw is operated to move vertically in the direction of the arrow A, the sheave 5 is caused to swing in the direction of the arrow B. It will be seen that this movement moves the periphery of the sheave 5 toward or away from the center line of the orifice of the die 3. In this way the periphery of the sheave 5 is brought into proper tangential relation with the wire W so as to center the latter respecting the orifice of the die 3, in one direction.

To arrange for transverse alignment of the sheave with the wire die orifice, the shaft 7 which

carries the bell-crank is mounted by means of hand-screws 10—10' which are secured in opposed relation, through the opposite side walls of the box 1, in alignment with the shaft 7. The inner extremities of the screws 10—10' are pointed to provide conical bearings 11 which are adapted to seat within conical journals 12 in the ends of the shaft 7. By moving the hand-screws 10—10' in the same direction simultaneously, the axial disposition of the shaft 7 can be varied. This, in turn, will, through the bell-crank 8, cause the sheave to be moved sideways into alignment with the vertical axis of the die orifice 3. Suitable lock nuts 13 are provided to lock the hand-screws 10—10' after they have been set to the desired adjustment. Annular flanges 14 are fixed about the shaft 7 to hold the bell-crank properly positioned on the shaft 7.

The box 1 is positioned over the bath 4 by means of a frame, illustrated in Figures 2 and 3. These figures illustrate the conventional pot or receptacle 15 for retaining the bath of molten zinc. This pot is mounted in refractories 16, whereby heat may be applied to maintain the bath in molten condition.

Bridging the bath is a frame 17 having uprights 18 at each side of the bath connected by a cross-member 19 from which hangs a screw 20 suspending the box 1. A nut 24 having an internally threaded bore engaging the screw 20 is journaled in the cross member 19. Shaft bearings 21 are provided adjacent the cross member and journal a shaft 22 carrying intermediate its ends a worm 23, the nut 24 having a toothed periphery worked by this worm 23. The end of the shaft 22 is provided with a crank 25 by the manipulation of which the shaft 22, the worm 23 and the nut 24 are, respectively, rotated to raise or lower the box 1 by screwing action between the nut 24 and screw 20.

From the foregoing description, it will be seen that a wire may be threaded through the box by raising the latter above the level of the bath and threading the wire beneath the sheave 5 and up through the die orifice 3. The die is detachable and may be removed from the box to facilitate this operation. The box is lowered by manipulating the crank 25 so as to position the die at any desired point beneath the surface of the bath 4 to give the extent of immersion required this depending on the temperature of the bath, the size of the wire, the speed at which the wire is traveling, and the purpose that the immersion is to serve. It is believed that the wire in coating operations can most advantageously be introduced to the coating bath after passing through the box, whereby it emerges from the latter in a vertical direction, although it is conceivable that the wire could run into the box after having passed through the coating bath, in which case the die orifice 3 would function to control the shape and size of the coating.

The foregoing is one example of our means for immersing elongated metallic articles in a bath so that objectionable features of the prior art are overcome, and so that the duration of immersion may be critically controlled if the application to which it is put should require that this be effected.

We claim:

1. Apparatus for immersing a flexible metal strand in molten metal, comprising a pot for containing the molten metal, a die for immersion in the molten metal in the pot and permitting passage of the strand but not the molten metal, means for continuously feeding the strand through the die to beyond the level of the molten metal in the pot, and a wall for separating the molten metal and the strand excepting for the space between the die and the molten metal level, the strand being immersed in the molten metal only while passing through said space and said apparatus including means for varying said space between the die and the molten metal level.

2. Apparatus for treating elongated metallic articles by immersion in molten metal baths, comprising a hollow body, entry and exit ports in said body, one of said ports being adapted for disposition beneath the surface of the bath, means for excluding the bath from the interior of said body and means for raising and lowering said body to alter the distance between the submerged port and the bath's surface.

3. Wire coating apparatus comprising, in combination, means for advancing wire past a molten metal coating bath; a sinker for deflecting said wire beneath the plane of the surface of the bath, and means for retaining the bath away from the surface of the wire between the bath's surface and the sinker at one side of the latter, and up to a point intermediate the wire's position of extreme deflection and the bath's surface at the other side of the sinker.

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